

November 2025 Meeting of the Scientific Guidance Panel for Biomonitoring California

Summary of Input and Recommendations

The Scientific Guidance Panel (SGP) for the California Environmental Contaminant Biomonitoring Program (also known as Biomonitoring California) met in Oakland on November 14, 2025. This document briefly summarizes input and recommendations received from the Panel, as well as the range of topics discussed with the audience. Visit the [November 2025 SGP meeting page](#) to access the presentations, transcript, and other meeting materials.

SGP Panel Members in Attendance

Amy Padula, PhD, MSc, Acting Chair
Carl Cranor, PhD, MSL
Timur S. Durrani, M.D., M.P.H., M.B.A.
Oliver Fiehn, PhD
Thomas McKone, PhD
José R. Suárez, MD, PhD, MPH
Lara Cushing, PhD, MPH, *attended remotely*
Ulrike Luderer, MD, PhD, *attended remotely*
Penelope (Jenny) Quintana, PhD, MPH, *attended remotely*

Program Update

[Presentation](#): Nerissa Wu, PhD, California Department of Public Health (CDPH)

[Presentation](#): Ian Tang, PhD, CDPH

Panel members and the audience discussed the following topics with Program staff:

- The inclusion criteria and monitoring methods utilized in the Community Health and Air Quality Implications of Refinery Retirements in Los Angeles (CHAIRS-LA) Study.
 - Participants in CHAIRS-LA are 18 years of age or older, live near a refinery property boundary, have lived in the neighborhood for at least one year and have no plans to move within the next year, are not tobacco smokers, and speak English, Spanish, or Tagalog.
 - Secondhand smoke exposure and commuting behavior is captured in questionnaires.
 - Fresh Air wristbands, which are used in CHAIRS-LA, are silicone wristbands that hold a passive air sampler. The silicone itself is not cut and tested.
 - Refineries release both continuous emissions and periodic emissions from flares. Since polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs) have short half-lives in the body, urinary PAH and VOC metabolites may not capture exposures from flaring unless it occurs just prior to urine sample collection. Since select metals measured in the urine have longer

half-lives in the body, urinary levels of these metals may reflect more long-term exposures.

- Biomonitoring California's analysis of persistent organic pollutant (POP) levels in Californians, which suggests that levels of hexachlorobenzene (HCB) are not decreasing over time.
 - Physical/chemical properties of HCB could partially explain the trend. It is stable in the environment, lipophilic and has a long half-life in the body.
 - Researchers who have done extensive work on persistent pollutants, global transport, and emission re-emission cycles, including Matt MacLeod from Stockholm University, should be contacted.
 - Primary analysis used data from female participants of reproductive age in Biomonitoring California datasets. Sensitivity analyses were performed and showed consistent results.
 - Future analyses of the HCB data may include:
 - Accounting for other variables such as:
 - Country of origin, to account for differing HCB regulations in other countries.
 - Body mass index (BMI) or obesity, in the subset of participants for which these data exist.
 - Duration of breastfeeding, in the subset of participants for which these data exist.
 - Considering absolute difference in addition to percent change over time and accounting for differing numbers of sampled participants (Ns) in each year of data.
 - Incorporating data from additional studies to increase power, such as the California Teachers Study and other cohorts from researchers who expressed interest in collaboration when this analysis was presented at the International Society of Exposure Science (ISES)/International Society for Environmental Epidemiology (ISEE) conference in 2025.
 - For data from other potential cohorts outside of California, analysts would have to consider how to address potential differences in populations or lab methods (e.g., limits of detection (LOD)).
- Future Biomonitoring California studies may consider asking participants about the use of Ozempic or other medications which may affect chemical retention and remobilization.
- Intra-Program Pilot (IPP) Studies are typically conducted for method development and field implementation testing. Sample sizes are small, so the Program does not use the data for making conclusions about the California population.
 - Previous IPP studies have focused on:
 - Measuring quaternary ammonium compounds (QACs) using an external lab to consider for use in Biomonitoring California studies.
 - Improvements to the PAH method using Biomonitoring California's Environmental Health Laboratory (EHL)
 - The most recent IPP is evaluating the results and acceptability of micro-sampling devices, as compared to venipuncture. PAHs and metals are currently being measured in capillary blood from micro-sampling devices and serum from

venous samples using EHL and Biomonitoring California's Environmental Chemistry Lab.

- The results from these IPP studies can be shared at future SGP meetings.

Results and Impacts of the FRESSCA-Mujeres Project

Presentation: Ileana Navarro, Central California Environmental Justice Network (CCEJN);
Mohammad Heidarinejad, PhD, PE, Illinois Institute of Technology (IIT);
Stephanie Jarmul, MPH, Office of Environmental Health Hazard Assessment (OEHHA)

Panel members and the audience discussed the following topics with guest speakers and Program staff:

- The higher levels of urinary 2-hydroxynaphthalene (2-naphthol), a metabolite of naphthalene, in the Farmworker women & Respiratory Exposure to Smoke from Swamp Cooler Air (FRESSCA-Mujeres) participants compared to the levels reported in the general US population as part of the National Health and Nutritional Examination Survey (NHANES).
 - The LOD for 2-naphthol in FRESSCA-Mujeres was about half of the 2-naphthol LOD in NHANES. However, both studies had one hundred percent detection rates, so the LOD difference does not explain the elevated levels in FRESSCA-Mujeres.
 - A recent study looking at occupational exposures of Black and Latina hairdressers in the Maryland/D.C. area reported 2-naphthol levels similar to those found in Central Valley participants.
 - The Minnesota Biomonitoring Program found elevated 2-naphthol levels in Black participants, though not as high as levels found in FRESSCA-Mujeres and the Biomonitoring component of the San Joaquin Valley Pollution and Health Environmental Research Study (BiomSPHERE). BiomSPHERE found a similar trend with Black participants, though a small N precluded the Program from making conclusions.
- Potential exposure sources of naphthalene for FRESSCA-Mujeres participants.
 - Natural gas composition may differ in the Central Valley and could contribute to the difference in 2-naphthol levels.
 - Mothballs are a source of naphthalene exposure.
 - Mothballs are not allowed to be sold in California. However, mothballs still may be found on online retailer sites or brought in from outside the State.
 - Participants in FRESSCA-Mujeres were not asked about mothballs, but the Program will include questions on mothball use in future study surveys.
 - Outdoor sources of exposures such as agricultural burning and widespread outdoor grilling in the Central Valley may be sources of naphthalene exposure.
 - Levels of PAH metabolites other than 2-naphthol were not especially high. Given that combustion and grilling are common sources of many PAHs, these are not likely the primary source of elevated 2-naphthol.
 - Naphthalene concentrations in air samples from FRESSCA-Mujeres were similar to those found in other studies, however, those studies are not reporting the same high levels of 2-naphthol in the urine.

- No associations were found between naphthalene in air and naphthalene metabolites in urine. Outdoor air monitoring data is limited, as there were only 8 outdoor air samplers.
- There were no differences in 2-naphthol concentrations by housing type in FRESSCA-Mujeres participants.
- The increase in 2-naphthol concentrations overnight suggests an indoor source.
 - A recent study reporting high levels of 2-naphthol in hairdressers, along with other evidence, suggests that exposures could be coming from dyes and fragrances in consumer products. Program staff are looking into research on hair products and chemicals, such as the work of Ami Zota.
 - A nutritional source consumed in the evening could also contribute to elevated urinary 2-naphthol levels in the first morning void.
- Possible reasons PAH metabolites other than 2-naphthol were the same or lower in FRESSCA-Mujeres participants compared to the levels reported in the general US population as part of the NHANES.
 - Other researchers have found that concentrations of PAHs in the air in the Central Valley have been declining over the past ten years, potentially due to regulations limiting diesel emissions and agricultural burning.
 - However, PAH air concentrations in the Central Valley remain higher than most of the country. Fresno and Bakersfield remain two of the most polluted cities in the US from traffic-related air pollution.
 - NHANES data were collected 10+ years prior to FRESSCA-Mujeres data, so it is difficult to determine if the differences in levels are due to temporality or geography.
- Participant perceptions of the air filtration solutions utilized in the study.
 - Results from testing a variety of filtration solutions in the pilot year indicated that participants preferred smaller/less bulky portable air cleaners (PACs) and swamp/evaporative cooler (EC) filters so only smaller options were implemented in the full intervention year. During the full intervention year, size/bulkiness of the PACs and EC filters was still the primary complaint. There were no complaints about noise.
 - Surveys indicated that participants would be willing to spend \$20 on air filtration. The tested filtration solutions were over \$100.
 - Energy costs were not a major concern, as ECs are relatively inexpensive to operate. Adding filters to the ECs does slightly increase power consumption.
 - IIT has paid participants for running portable air cleaners in other studies and found that it does not impact runtime.
- Participant use of the air filtration interventions during the study period.
 - Plug load loggers (PLLs) reported when and at what speed the PACs and ECs were run throughout the study. There were not PLLs on all ECs, so IIT developed a method to predict runtime.
 - According to the measured and predicted runtime data, swamp cooler use during the hours between the fall evening and morning urine samples was minimal.
 - The study was designed anticipating that weather would follow trends of prior years in which periods of intense wildfire smoke coincided with extreme heat. Due to no major wildfire during the study period, samples

- were collected in October. Milder weather likely minimized swamp cooler use at night.
- Particulate matter concentrations peaked at about 35 microgram per meter cubed ($\mu\text{g}/\text{m}^3$) during the minor wildfire events which occurred during the study period; whereas typical major wildfire events see concentrations above $100 \mu\text{g}/\text{m}^3$.
 - Positive perceptions and results suggest that the filtration solutions tested may be more beneficial during a major wildfire.
- Selection of metabolites measured in FRESSCA-Mujeres and other Program studies.
 - PAH and VOC metabolites and metals were selected for FRESSCA-Mujeres as they are generally apparent in wildfire smoke, and the goal of the study was to capture exposures during a wildfire event. The specific chemicals and metabolites included for each panel were determined by what is on Biomonitoring California's list of Designated chemicals and lab capabilities.
 - Biomarkers of stress were also measured in FRESSCA-Mujeres.
 - Previous Program studies have included 4 biomarkers of response measured by Nina Holland's lab. For FRESSCA-Mujeres, study collaborators measured 19 different biomarkers of stress with the Wadsworth Center in New York.
 - Associations between biomarkers of exposure and stress in FRESSCA-Mujeres may be assessed.
 - Program staff are not aware of a specific biomarker for particulate matter.
 - Jeff Wagner's lab utilized electron microscopy on airborne particulate matter samples from FRESSCA-Mujeres to get the size fractions, chemical components, and some source information.

Planning for 2026 SGP Meetings

[Presentation](#): Stephanie Jarmul, MPH, OEHHA

Panel members expressed support for the Program to consider the following topics for future SGP meetings:

- Developing methods to define an integrated measure associated with climate change, through specific biomarkers of exposure and stress.
 - The Program is already looking at individual climate-related stressors such as wildfires and heat stress.
 - Telomere length was measured in saliva samples of FRESSCA-Mujeres participants. This measure is currently beyond the scope of Biomonitoring California but may be a cumulative measure for others to consider.
- Current uses of Artificial Intelligence (AI) for Biomonitoring California, such as for non-targeted analysis, and potential future applications.
 - AI methods are best utilized on large, complex datasets.
 - Obtaining a composite measure of climate change stress may be a fitting application for AI.

- Semi or non-targeted screening in existing biospecimens could be an efficient method of obtaining additional data, which could also be analyzed with a climate stress metric.
- Potential chemicals to consider adding to Biomonitoring California's lists of Designated and Priority chemicals.